

understood that the terms “include/comprise” and/or “have” when used in this specification, specify the presence of stated features, integers, operations, elements, components, and/or combinations thereof, but do not preclude the presence or addition of one or more other features, numbers, operations, elements, components, and/or groups thereof.

[0049] Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which examples belong. It will be further understood that such terms, including those defined in commonly-used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0050] When describing the examples with reference to the accompanying drawings, like reference numerals refer to like constituent elements and a repeated description related thereto will be omitted. When it is determined discussions related to a related known operation or configuration that may make the purpose of the examples unnecessarily ambiguous in describing the examples, such discussions in the detailed description will be omitted here.

[0051] Hereinafter, reference will now be made in detail to examples with reference to the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0052] FIG. 1 illustrates broadcasting a safety message (SM) in accordance with an embodiment.

[0053] A vehicle 110 reports a state of the vehicle 110 to neighboring vehicles 111, 112, 113, 114 and 115 located adjacent to the vehicle 110. For example, the vehicle 110 may broadcast a message including information about the state of the vehicle 110 to the neighboring vehicles 111 through 115. The neighboring vehicles 111 through 115 may receive the message from the vehicle 110, and may adjust their operation based on the state of the vehicle 110. Vehicles may transmit and receive messages using a vehicle communication technology, for example, a vehicle-to-vehicle (V2V) network.

[0054] The neighboring vehicles 111 through 115 receiving the message from the vehicle 110 are located in an exemplary range 120, e.g., defined by radius around the vehicle 110. The range 120 is, for example, a coverage of a wireless communication scheme to broadcast a message.

[0055] The vehicle 110 may broadcast a message using a wireless communication scheme. Depending on embodiment, the wireless communication scheme may use or operate in accordance with an Institute of Electrical and Electronics Engineers (IEEE) 802.11p standard, such as a dedicated short-range communications (DSRC) scheme or other conforming scheme, and/or an IEEE 1609.x standard for wireless access in vehicular environments (WAVE), noting that alternative communication schemes are also available. For example, a wireless communication scheme based on the IEEE 802.11p and the IEEE 1609.x for WAVE may be referred to as a DSRC or WAVE communication scheme.

[0056] All the vehicles 110 through 115 may use the same frequency band or channel to broadcast messages, as only an example. A message from a vehicle failing to acquire a communication channel for any reason, such as an insufficient communication capacity among the vehicles 110

through 115, may not be broadcast. Such a failure may be due to failures to access a network or communication channel by either of broadcasting or intended receiver(s). As such, an emergent or urgent message of the vehicle 110 may not be broadcast to the neighboring vehicles 111 through 115 or may not be broadcast in sufficient time. In this case, if vehicle 110 fails to acquire a communication channel, and the vehicle 110, for example, suddenly stops, a state of the vehicle 110 may not be broadcast to the vehicle 111 in the rear of the vehicle 110.

[0057] In a case such as the one stated above, real-time message broadcasting may be important. That is, in one or more embodiments, an emergent or urgent message from vehicle 110 should be instantly broadcast to the neighboring vehicles 111 through 115. Hereinafter, through one or more embodiments, methods of transmitting a vehicle message is further described with reference to FIGS. 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.

[0058] FIG. 2 illustrates a configuration of a vehicle message broadcasting apparatus 200 in accordance with an embodiment.

[0059] Referring to FIG. 2, the vehicle message broadcasting apparatus 200 (hereinafter, referred to as the “apparatus 200”) includes a communicator 210, a processor 220, and storage 230. The apparatus 200 may be included in, for example, the vehicle 110 of FIG. 1, or the apparatus 200 may be the example vehicle 110 of FIG. 1, for example.

[0060] The communicator 210 is communication hardware configured to exchange data and/or information with an external apparatus. The communicator 210 may be wirelessly connected to differing components or apparatuses of a vehicle in which the apparatus 200 is installed. For example, the apparatus 200 may be included in an on-board unit (OBU) or an on-board equipment (OBE) of the vehicle.

[0061] The processor 220 may be, for example, a hardware processing device or processor. The processor 220 may process data received by the communicator 210 and data stored in the storage 230.

[0062] The storage 230 may store data received by the communicator 210 and data processed by the processor 220.

[0063] Hereinafter, example operations of such a communicator, the processor and storage are further described with reference to FIGS. 3 through 11. For convenience, below operations of FIGS. 3-11 will be discussed with reference to the example communicator 210, processor 220, and storage 230, noting that alternatives are available.

[0064] FIG. 3 illustrates a vehicle message broadcasting method in accordance with an embodiment.

[0065] Referring to FIG. 3, in operation 310, the processor 220 generates an SM. The SM is, for example, a message about a driving state of a vehicle. For example, the processor 220 may generate the SM based on a society of automotive engineers (SAE) J2735 message standard.

[0066] As only examples, the SM may include at least one of a message identifier (ID), a message count, a temporary ID, time, a latitude, a longitude, an elevation, a position accuracy, a transmission, a speed, a heading direction, a steering wheel angle, an acceleration, a break system status, and a vehicle size, in association with a vehicle. As only further examples, the SM may include at least one of an event flag, a path history, a path prediction, and a Radio Technical Commission for Maritime Services (RTCM) package.